

BOLT STRAIN series BTM/BTMC GAUGES

These gauges are used for measurement of tensile strain of bolt. They are simply inserted into pre-drilled hole in the bolt with exclusive adhesives. This method is recommendable when an ordinary strain gauges can not be mounted on the bolt surface. Accurate tensile force measurement is possible by calibrating the bolt after installing the bolt gauges.

Operating temperature range
 -10°C  +80°C
 Temperature compensation range
 Not available

BOLT AXIAL STRAIN MEASUREMENT

Gauge pattern	Basic type	Gauge size		Backing		Resistance Ω
		L	W	L	W	

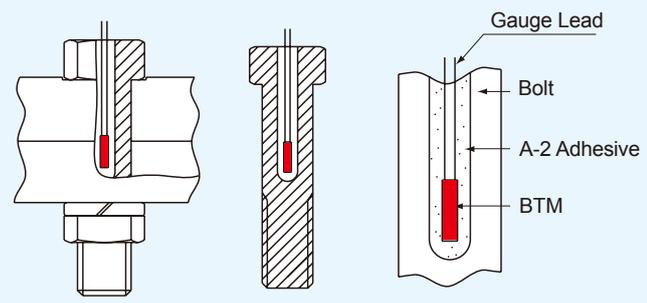
series BTM 

The BTM bolt gauges use heat-curing A-2 adhesive for installation, which provides better long-term stability.

 Applicable adhesives

A-2	-10 ~ +80°C
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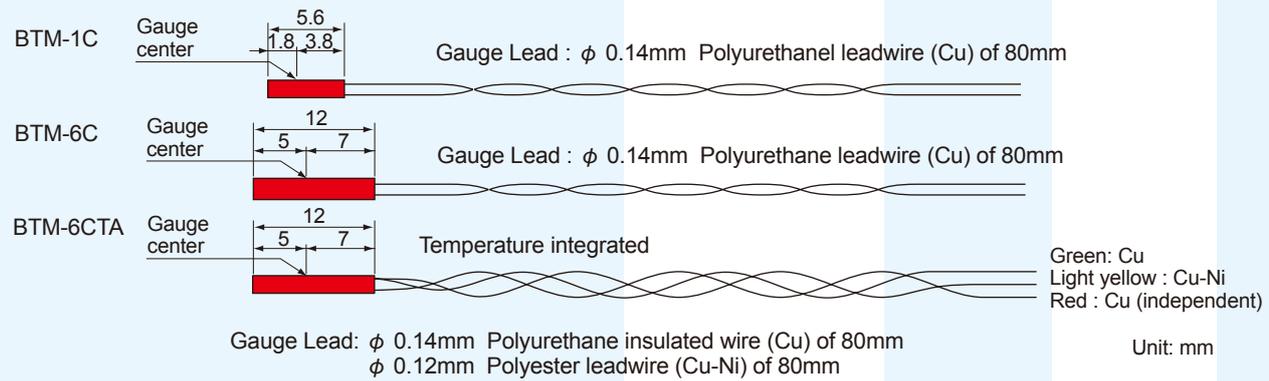
 Each package contains 10 gauges.



BTM-1C Hole drilled: ϕ 1.6mm	1	0.7	5.6	1.4	120
BTM-6C Hole drilled: ϕ 2.0mm	6	1	12	1.7	120
BTM-6CTA Hole drilled: ϕ 2.0mm	6	1	12	1.7	120

Temperature integrated applicable in -10~+80°C

NB : Polyurethane insulation of the gauge leads is easily removed by heat of soldering iron, while Polyester sheath is removed by chemical solvent.



Optional syringe and needle

Applicable to	Needle diameter	Needle length
BTM-1C	1.5mm-dia.	60mm
BTM-6C	1.8mm-dia.	100mm

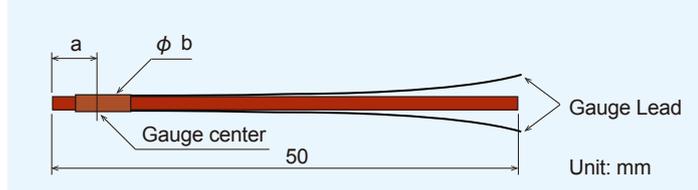
Exclusive syringe for injecting A-2 adhesive into the pre-drilled hole before BTM-1C or -6C gauge is embedded.

series BTMC 

The BTMC gauges have a tube shape sensing element, and they are installed with fast-curing CN adhesive. The installation is easily made at room temperature.

 Applicable adhesives

CN	-10 ~ +80°C
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Basic type	Gauge Length (mm)	Gauge Center a (mm)	Backing diameter phi b (mm)	Resistance Ω
BTMC-05-D10-003LE Hole drilled: ϕ 1.0mm	0.5	5	ϕ 0.9	120
BTMC-1-D16-003LE Hole drilled: ϕ 1.6mm	1	5	ϕ 1.5	120
BTMC-3-D20-006LE Hole drilled: ϕ 2.0mm	3	10	ϕ 1.9	120

Gauge Lead: ϕ 0.1mm Polyimide insulated of 30mm for BTMC-05 and BTMC-1, 60mm for BTMC-3

Bolt strain gauge installation/calibration service

Currently, bolts are used in various fields for connecting structural members. Confirmation and management of the fixing condition are possible by measuring axial force applied to the bolt in machine structures, cars, airplanes, expressways, bridges, fixing of segments and so on. Also the axial force measurement is useful for knowing the strength of bolt and designing the bolt connection.

TML offers strain gauging service for measurement of axial force acting on bolts. The service includes drilling a hole, fixing the gauge, connecting the cable, and applying load calibration to the bolt supplied by the customer. Strain gauge installation service for high temperature is also available.

Processing method

There are two methods in strain gauge installation service. One is embedding, and the other is bonding.

Embedding BTM/BTMC series

A hole of 1.0mm, 1.6mm or 2mm in diameter is drilled in the center of the bolt. The strain gauge is inserted into the hole and embedded with an exclusive adhesive. This method has the advantage of avoiding the gauge being damaged by a washer, etc. while fastening the bolt.



Bonding F, QF, ZF, CF series

Two strain gauges are bonded on both sides of the bolt shaft in axially symmetric positions to cancel the influence of bending. It is required to slightly scrape off the surface of the bolt shaft where the strain gauges are bonded, for the purpose of avoiding strain gauges being damaged while fastening the bolt or by contact of a washer. Choose strain gauges according to the usage conditions including temperature.



Calibration service

In order to achieve accurate measurement, we offer calibration service that the bolt is calibrated with specified load. Instruments and calibration machines used for the calibration service are periodically calibrated and inspected by public institutions traceable to the national standards.

■ TENSILE TEST OF BOLT

M10×50

No.	Serial No.	Strain output (×10 ⁻⁶)					Non-linearity (%RO)	Calibration coefficient (kN×10 ⁻⁶)	
		0 kN	4 kN	8 kN	12 kN	16 kN			20 kN
1	KNE000001	0	550	1105	1649	2207	2773	0.5	0.007212
2	KNE000002	0	593	1200	1809	2421	3032	0.4	0.006596
3	KNE000003	0	571	1140	1710	2287	2860	0.3	0.006993
4	KNE000004	0	578	1156	1748	2339	2935	0.6	0.006814
5	KNE000005	0	579	1173	1776	2377	2986	0.7	0.006698
		0	554			2239	2806	0	

※ Instrument K=1.000(G.F.=2.00)

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